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ABSTRACT

This paper discusses technical considerations surrounding open network architecture (ONA), specifically: (1) the technical characteristics of the Public Networks (Local Exchange Carriers LATA Networks); (2) the impact of ONA success on the Public Network and some concerns that will have to be addressed in the early implementation stages; and (3) concerns for the security of the Public Network in the light of a vigorous and successful development of open network architecture. It is concluded that: (1) from a technical point of view, ONA implementation will proceed at a rate that is frustrating to some, but which is bound by the technical realities of the Public Network; (2) anything that can expedite replacing the older switching technology will help; (3) as ONA is implemented and becomes used in interesting quantities, the Local Exchange Carrier will have to evolve equipment provisioning procedures and rules and, in all probability, will purchase more equipment; and (4) thought must be given to how signaling systems are extended to ensure that the traditional integrity of the American telephone network is preserved. (GL)

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ONA IMPLEMENTATION IMPACT

B.J. Eckhart, Northern Telecom

Thank you Mr. Chairman, Good Morning Ladies and Gentlemen. It is a real pleasure to be here, outside of my normal engineering circles, and have an opportunity to partake of discussions concerning regulatory and other matters. In this company ,I will put discretion ahead of valor and confine my remarks to technical matters.

I would like to take this opportunity to discuss what I hope are some relevant, and hopefully objectively technical considerations surrounding the topic of Open Network Architecture. As the chairman indicated I am from Northern Telecom, and have spent all my career involved in the design and marketing aspects of Public Network Switching Systems.

I am going to look at the implications of ONA from three aspects this morning:

First I will look at some of the technical characteristics of the Public Networks, that is the Local Exchange Carriers LATA networks.

Second will be a look at what impact ONA success will have on the Public Network and some of the concerns that will have to be addressed in the early implementation phases.

My last topic will be some of the concerns which we have in looking at the network as an entity in the light of a vigorous and successful development of Open Network Architecture.

1. THE PUBLIC LATA NETWORK:

ONA primarily impacts the Switching Centers within the network. If we survey the Switching Systems which are now deployed within the network, both in the Bell Operating Companies and the Independent Operating Companies, we find basically two types of systems: Analog Stored Program Controlled Analog systems, dominated by the #1A ESS system, and newer Stored Program Controlled Digital Switching Systems, The majority being either Northern Telecom DMS systems or AT&T supplied #5 ESS systems.

At the risk of offending my good friends at AT&T Network Systems allow me to offer some gratuitous thoughts on their #1A ESS system.

#1A ESS systems are at the end of their effective marketing life. This does not mean they are at the end of their cost effective service life within the telcos, just that the manufacturer likely does not see any highly profitable market in maintaining the development capabilities to continue evolution of the #1A ESS system. Significant quantities of #1A Ess technology will remain

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in the network through the decade of the 1990s.

#1A ESS software technology is the technology of the 1960's, machine language based, powerful but very complex and rather difficult to modify, especially after some 20 years of enhancements and change. The cost of modification is very high and the payoff will likely be small for the system vendor.

If we expect significant changes to #1A ESS software to add new BSE and BSA's we have to expect significant delays and high costs. Other options exist, using network structure, which will be discussed under my second point.

Turning now to the Stored Program Controlled Digital systems, these are very much still within their effective marketing life. They use the software technology of the 1970-80's which is considerably more flexible than that of the 1960's but still leaves much to be desired for the evolution of complex systems made up of Millions of Lines of Code.

This is not a characteristic of Switching Systems alone, one need only consider the IBM & Microsoft delays in releasing an effective OS/2 environment, Lotus difficulties in 123 release 3 etc., etc. Switching systems are one or more orders of magnitude more complex than these PC systems.

The telephone industry has reacted to the difficulty of evolving these complex and very highly featured software systems with the Intelligent Network (IN) architectural proposals. In my personal opinion, this approach is proving only marginally effective. IN studies are trying to solve problems stemming from system complexity with architectural changes that themselves require increases in system complexity. This effect is compounded by the very great difficulty in arriving at a consensus on what steps to take, in a very competitive vendor environment.

The net result is that perhaps a Telco can respond to requests for significantly new arrangements with a plan or policy statement within a period like 120 days but it is NOT reasonable to expect significant network changes to take place in less than the more typical 2 year time frame. This is the amount of time it takes today for the telco to accurately specify a service, the vendor to develop the capability within a DMS or #5 ESS or EWSD system, then the telco to deploy and commission a significant new service.

I make these comments, not in any way, in a defensive manner or criticizing the industry's capabilities. Todays Stored Program Control systems are among the most complex real time control systems in existence, bar non. Their performance in speed and reliability is unmatched. But there are limits to todays software technology.

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The next generation of software technology is now on the horizon. Discussion of its characteristics and timing are a favorite topic for debate, but will have to wait for another day. Suffice it to say for today, that the velocity of change we have today will be with us in the network for another 4 to 5 years. Of course, in the laboratory we can do better today, but that is of value only in giving us the confidence that the next step will happen.

2. After that rather discouraging discussion let me assure you that we are in fact enthusiastic about the business opportunities for ONA. I look upon this as definitely a positive sum game, that is, everyone can win the subscribers, the telcos, system vendors and the Enhanced Service Providers. But I promised to confine myself to technical discussions.

What impact will widespread successful use of ONA arrangements have on the network? As a system vendor, I really enjoy this discussion, because the first impact will be a higher per call processing load in the Public Network Switching Systems. To implement the ONA arrangements more logical checks will be required in the logical processing of every telephone call. If an enhanced service is exercised, the protocols used to export the call to the Enhanced Service Provider will consume processing power. Quantitative estimates are difficult but I believe we will find somewhere between a 10% and 20% increased load for system processing and system memory requirements. This is in addition to any equipment which the Enhanced Services Provider owns and uses.

Recall the #1A ESS discussion. The way around the #1A ESS system is to provide ESP access through some tandem point in the network. This tandem point can use current Digital technology and require only minor rather than significant #1A ESS software upgrades. This approach is analogous to the equal Access tandem office which was used at divestiture to provide Inter Exchange Carrier access to the LATA.

This in turn all means that more equipment is going to be needed by the Local Exchange Carrier, (we will be more than accommodating in its supply), and the LEC is going to have to control and implement the network provisioning for ONA. POPs are here to stay and will likely broaden in their applications.

In addition, call set up times could increase by approximately one second, depending on a wide set of assumptions. This may not seem like a significant amount, but the deliberations over the INWATS 800 services has likely heightened many peoples interest in call setup times.

09. 29. 89 09:45 AM *NTI RTP 992 1083 P05

3. What concerns does a Network Design Technologist as we move forward into the Open Network Architecture era. I approach this part of the discussion because we do have concerns for the security of the public network. This is a topic which has given rise to some emotion ever since the Carterphone days. I hope to avoid moving over the bounds of technical objectivity.

I hasten to add that I believe that there are very acceptable ways of protecting the network without significantly deviating from a truly OPEN architecture. It is necessary, however, to carefully think through the way in which signaling systems are opened up. When push button phones were first introduced the network designers very cleverly specified a different tone set arrangement for signaling TO the network than form signaling WITHIN the network. At first glance this might seem like silly economics, why not use one design and benefit from the economics of scale. The answer is that a malicious subscriber is prevented from messing with or defrauding the network by this simple step.

Because there is no overlap in the signals, between the touch tone signaling system and the Multifrequency signaling systems, a very large security exposure is avoided. Of course, some very clever and devious people, Captain Crunch, got around the problem and invented the blue box, but the signaling differences minimized the opportunity.

One of the most important recent upgrades in the Public Network is the use of powerful message oriented out of band signaling systems. Within the network this is Signaling System #7. In the ISDN world an equally powerful signaling system has been designed and implemented as the ISDN access signaling - Q.931 signaling protocol.

Maintaining the ISDN access protocols as the ESP, - Network arrangements, rather than extending SS7 will serve us extremely well as ONA successfully expands the service opportunities for our subscriber base.

Let me briefly summarize in conclusion.

From a technical point of view, ONA implementation will proceed at a rate which is frustrating to some, but which is bound by the technical realities of the Public Network. Anything that can expedite replacing the older switching technology will help.

As ONA is implemented and becomes used in interesting quantities the LEC will have to evolve his equipment provisioning procedures and rules, and in all probability purchase more equipment.

Thought must be given to how signaling systems are extended to ensure that the traditional integrity of the American telephone network is preserved.

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